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NOTES ON PHALLOSTETHID FISHES

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Various notes on the remarkable little fishes of the Malayan family Phallostethidae accumulated while I was in charge of the division of fishes of the United States National Museum, and it seems opportune to publish them at this time. Most of the material reported on is in the National Museum.

In a recent paper (Myers, 1935, p. 6) I erected a new suborder, Phallostethoidea, for this family, which I placed next to the Mugiloidea and the Polynemoidea in the Percesoces. The recent work of Bailey (1936) appears to uphold my conclusion that the Phallostethidae are not cyprinodonts. The following synopsis of the genera, based largely on the priapium of the male, will replace that given in my 1928 paper:

SYNOPSIS OF THE GENERA OF PHALLOSTETHIDAE

a[1]. Toxactinium present, a shieldlike pulvinulus covering its base.
  b[1]. Anal fin very long, of 26 to 28 rays; the single ctenactinium serrated; jaws equal or lower slightly included; first dorsal not described; abdomen of female with a groove--Phallostethus Regan
  b[2]. Anal fin moderate, of 14 or 15 rays; the single ctenactinium not serrated; lower jaw projecting; first dorsal of one ray; abdomen of female without groove----------Phenacostethus Myers

a^2. Toxactinium absent; pulvinulus if present small and not shield- or disk-shaped.

c^1. First dorsal fin represented by at least one ray; nape and opercles scaleless.

d^1. One long ctenactinium present.

e^1. Ctenactinium thin and considerably curved, without a membranous fold along its edge; priapium, in region of infrasulcar prominence, lacking a flat, many-spined process; posterior border of priapium with a series of soft, comblike projections ..... Neostethus Regan

e^2. Ctenactinium not greatly curved, with a broad membranous margin along lower side of its proximal half; region of infrasulcar prominence with a large, flat, fleshy process armed on its upper and posterior border with 9 or 10 short, sharp, recurved spines and on its anterior border with 2 longer spines directed forward; posterior end of priapium without comblike appendages ..... Plectrostethus Myers

d^2. Two long ctenactinia present; no comblike appendages at end of priapium.

f^1. Pulvinulus plainly evident externally as an oval prominence with a depressed center, on aproctal side of priapium; body extremely slender and elongate; brackish-water fishes ..... Ceratostethus, new genus

f^2. Pulvinulus not evident externally; body moderately heavy; hill-stream fishes ..... Gulaphallus Herre

c^2. First dorsal fin absent; 2 ctenactinia, the lesser one very short; nape and opercles scaly ..... Mirophallus Herre

Genus PHALLOSTETHUS Regan

PHALLOSTETHUS DUNCKERI Regan

No further specimens of this species, which was described from Johore, have been reported since Regan's original description.

Genus PHENACOSTETHUS Myers

PHENACOSTETHUS SMITHI Myers

Neostethus lankesteri (not of Regan) H. M. Smith, 1927, p. 353 (Bangkok, Siam); 1929, p. 13 (Bangkok, Siam).

Phenacostethus smithi Myers, 1928, p. 6 (Bangkok, Siam).—Bailey, 1936 (anatomy).

This minute species is represented by several hundred specimens in the collections of the United States National Museum (nos. 88659, 88667, 93506, 93507, 93508), as well as paratypes of the species (nos. 92297, 92979). All were collected in canals in the city of Bangkok, Siam, by Dr. Hugh M. Smith. This is the only phallostethid present in Dr. Smith's Bangkok collections, and there is no doubt that it is the species he reported in 1927 as *Neostethus lankesteri*. *P. smithi* is known from no locality other than within the city limits of Bangkok.

Genus NEOSTETHUS Regan

NEOSTETHUS LANKESTERI Regan

This species is known only from the types.

NEOSTETHUS AMARICOLA (Villadolid and Manacop)

Gulaphallus amaricola VILLADOLID and MANACOP, 1934, p. 194, pl. 1 (Pasay, Rizal Province, on Manila Bay, Luzon; in brackish sloughs).

This species has only recently been described, although it was mentioned several years ago (Myers, 1928, p. 11). The U. S. S. *Albatross* obtained what I take to be this form at several localities in Luzon and Leyte, all apparently brackish-water habitats. There are three males from a fish pond at San Antonio, Cavité, Manila Bay (U.S.N.M. no. 98833); two males from the mouth of the Palani River, Port San Vicente, at the northern end of Luzon (U.S.N.M. no. 98834); six immature specimens from the Ragay River, Ragay Gulf, on the south coast of Luzon (U.S.N.M. no. 98835); and one male and three females from brackish water in the river at Port Dupon, Leyte (U.S.N.M. nos. 98836 and 98837).

This species is very close to *N. lankesteri*, differing chiefly in the presence of two (instead of one) rays in the first dorsal fin and slightly but sharply in the structure of the priapium in the region of the infrasulcar prominence. *N. lankesteri* has two projections in this region, the seminal papilla and the infrasulcar prominence; *N. amaricola* appears to have but one, which Villadolid and Manacop call a "penislike structure." This bears one short spine, which they identify as a second ctenactinium. I am inclined to doubt this identification; very likely this small spine is the homologue of the papillary bone that supports the seminal papilla in *N. lankesteri*. At any rate, this sharp external spine serves to distinguish *N. amaricola* immediately from its close relative.

NEOSTETHUS SIAMENSIS, new species

Holotype.—U.S.N.M. no. 102140, a female 28.7 mm in standard length, collected in the estuary of the Chantabun River, southeastern Siam, in April 1933, by Dr. Hugh M. Smith.

Before his return from Siam, Dr. Smith sent me this single female as a phallostethid of a type entirely new to him. Only this one specimen was obtained. While in most cases it is not possible to determine the genus of fishes of this family without male specimens, the general habitus of this example makes me think it is probably closely related to *Neostethus*, even if it is not a member of that genus. The compressed, deep body distinguishes it immediately from the specimens of *N. amaricola* recorded above. Judging from

Regan's descriptions and figures of *N. lankesteri*, which has only one first dorsal ray (see Myers, 1928), I do not think it can be that species. I do not believe that it can be placed in any other genus of Phallostethidae. This is the second species of phallostethid known from Siam, and its discovery close to the Cambodian border makes it appear certain that fishes of this family occur in Indo-China.

Description.—First dorsal fin II. Second dorsal I, 5. Anal I, 15½. Pectoral 12. Caudal with 12 branched rays and several unbranched supporting rays above and below. Scales mostly lost, but 31 pockets can be counted from head to caudal base. Nape and head scaleless. Transverse scales between mid-dorsal series and abdominal keel, at deepest part of body, 7. First dorsal origin over base of eleventh branched anal ray. Origin of second dorsal over base of last anal ray. Pectorals long and pointed, the upper rays longest, reaching two-thirds of the distance from the upper part of the fin base to the origin of the anal fin. Caudal forked.

Measurements in millimeters (taken from point to point, as indicated, with dividers, and not as to the vertical on the axis of the fish): Standard length 28.7. Depth (less abdominal keel) 6.3. Head 5.5. Snout tip to origin of second dorsal fin 23.0. Snout tip to origin of anal fin 16.5.

Anus and postanal papilla very similar to those of *N. lankesteri* (see Regan, 1916, p. 16, fig. 12b). The papilla is less strongly bifid than in that species, but, like it, one of the halves (left) is better developed. This may have some bearing on the occurrence of "rights" and "lefts" among the males.

Color (specimen fixed in formalin) pale yellowish, probably translucent in life. A black hair-line marking the division between the epaxial and hypaxial trunk muscles from head to caudal. Another fine black line along base of anal fin and middle of lower surface of caudal peduncle to caudal fin. Above this line, on the anal base, is another fine black line marking the junction of the body muscles and the supports of the fin. A few black chromatophores along the dorsum, a large patch on the occiput, another patch on the upper surface of the snout, and one on the lower part of the pectoral girdle. Other melanophores are dusted along the sides of the snout and jaws, in a segment of a circle behind the eye, and on either side of the anus and postanal papilla. Fins hyaline.

Remarks.—There is a distinct possibility that this fish is identical with *N. lankesteri*, although only one first dorsal ray is reported for that species. If Regan's figure (Regan, 1916, pl. 1, fig. b) of *N. lankesteri* is correct in its proportions, which I see no reason to doubt, *N. siamensis* differs otherwise in the greater depth and the much more posterior positions of the dorsal and anal fins.

Genus PLECTROSTETHUS Myers

PLECTROSTETHUS PALAWANENSIS Myers

Plectrostethus palawanensis MYERS, 1935, p. 5 (mouth of the Caiholo River, Ulugan Bay, west coast of Palawan).

This slender little species has the most strongly rectilinear body form of any phallostethid. That it has breeding habits similar to *Gulaphallus* and *Phenacostethus* is indicated by a grapelike cluster of eggs that was still attached to the vent of one of the females when I first examined them. These eggs are now U.S.N.M. no. 93424.

CERATOSTETHUS, new genus

Genotype.—Neostethus bicornis Regan.

Outside of *Phallostethus*, the fishes of this new genus are the slenderest of all the phallostethids. The "neck" in particular is exceedingly slender. In this, and in their brackish-water habitat, they differ strongly from the two known species of *Gulaphallus*.

CERATOSTETHUS BICORNIS (Regan)

Neostethus bicornis REGAN, 1916, p. 14, fig. 11 (Kuala Langat, Selangore).—MYERS, 1928, p. 9 (compiled).

This form has been known hitherto only through the three immature type specimens in the British Museum. Besides eight adults collected by Dr. A. W. Herre in brackish water in the northeastern end of Singapore Island (U.S.N.M. no. 102142), the National Museum has six adults collected by the U. S. S. *Albatross* at Nakoda Bay, on the west coast of the island of Palawan (U.S.N.M. nos. 98838 and 98839) and a single adult from the Malampaya River, Palawan (U.S.N.M. no. 98840).

There is little difference between the adult males and the subadult figured by Regan (1916, p. 15, fig. 11b), except in the more pendulous posterior end of the priapium, the better-developed oval pulvinulus, the more pointed opercle, and the better development of the two ctenactinia. The smaller ctenactinium is little longer than on Regan's fish but more slender and curved. The longer ctenactinium is curved upward, downward, and around the chin. There are two rays in the first dorsal, and the second dorsal appears to have only 4 or 5 rays. Despite the fact that only one first dorsal ray has been found in the types, I feel certain that these Singapore and Palawan fishes are the same species.

The anus of the female is surrounded by many folds of loose tissue, this area being larger than in *Neostethus lankesteri*. I do not, however, find what I am certain is a homologue of the postanal papilla of that species. The oviduct (and ureter?) appear to open

at the end of a median tubelike structure some distance behind the anus. On each side of this structure is a longitudinal ridge. In the Palawan females these lateral ridges, as well as the median lower edge of the tubelike median organ, each bear a row of exceedingly minute spines; the preservation of the Singapore specimens is so poor that I cannot be sure of the presence of these spines in them.

Genus GULAPHALLUS Herre

GULAPHALLUS MIRABILIS Herre

Villadolid and Manacop (1934) have given an interesting account of the habits, breeding, embryology, and the ontogeny of the external features of the priapium in this species (see Herre, 1925), based on studies of examples obtained in Molawin Creek, Laguna de Bay, near the College of Agriculture of the University of the Philippines. From this it is evident that the ctenactinia are used as claspers, that fertilization is internal, and that the eggs are deposited to hatch externally. Smith (1927) had observed that the eggs are deposited and not hatched within the female in *Phenacostethus*, but he apparently made no observation on the copulation.

Bailey (1936) gives a detailed account of the osteology of this species. I have examined numerous specimens of this species from Molawin Creek, sent to me by Dr. Villadolid.

GULAPHALLUS EXIMIUS Herre

Of this fresh-water species (see Herre, 1925), the largest and bulkiest of the phallostethids, I have examined two topotypes, adult male and female, collected by Dr. Herre in 1931 in a brook near Santa Fé, Nueva Vizcaya Province, Luzon. They are in the collection of Stanford University.

Genus MIROPHALLUS Herre

MIROPHALLUS BIKOLANUS Herre

The three cotypes of this species (Stanford University no. 24475), described by Herre (1926), that I have examined are immature and in poor condition. There is no vestige of the first dorsal fin.

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